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ABSTRACT

The purpose of this study is to evaluate the efficiency of non-thermal plasma and heterogeneous photocatalysis processes for indoor air treatment using cylindrical continuous reactor at pilot scale and high flow rates. Trichloromethane ($CHCl_3$) also called chloroform was chosen as a model pollutant representing hospital indoor air. This pollutant is considered as carcinogenic, mutagenic and reprotoxic agent. The effect of several parameters such as inlet pollutant concentrations (25-300 mg m^{-3}), flow rates (2 to 8 $m^3 h^{-1}$), relative humidity of the effluent (5, 30, 50 and 90 %) as well as input of the plasma discharge (9 to 21 kV) on the photodegradation of trichloromethane is investigated.

Our findings show that the increase of flow rate leads to a reduction of degradation efficiency, while the humidity promotes the degradation in the case of photocatalysis process due to the formation of $OH^{\bullet}$ radicals.

Moreover, the addition of a photocatalyst under UV radiation in the discharge zone enhances the reduction of ozone and CO gases compared to plasma process alone.

The combination of plasma DBD and photocatalysis enhances the removal efficiency with a synergetic effect, leading to removal efficiency higher than 10% if we consider the sum of the contribution of each process separately.